

CLAIMS

What is claimed is:

1. A method of manufacturing a lithium secondary cell which comprises:

assembling a positive electrode, a negative electrode, and a separator between the positive electrode and the negative electrode, in an electrolytic solution, the positive electrode containing lithium titanate as an active material, the negative electrode containing carbonaceous material as an active material, and the electrolytic solution comprising a lithium salt in an organic solvent;

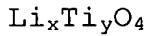
doping lithium ions into the negative electrode; and

sealing the positive electrode, the negative electrode, the separator and the electrolytic solution in a space formed by a positive electrode can, a negative electrode can and an insulation packing.

2. The method of claim 1, wherein the doping is performed by placing metallic lithium in the cell.

3. The method of claim 1, wherein the doping is performed by placing in the cell metallic lithium in an amount corresponding to about 80% of an electric capacity of the positive electrode.

4. The method of claim 1, wherein the lithium titanate has a composition represented by the formula:



wherein x and y are between about 0.8 and about 1.4 ($0.8 \leq x \leq 1.4$) and about 1.6 and about 2.2 ($1.6 \leq y \leq 2.2$), respectively.

5. The method of claim 1, wherein the lithium ions are doped and dedoped at a nominal voltage of about 1.5 V.

6. The method of claim 1, wherein the lithium titanate was prepared by heating titanium oxide and a lithium compound at a temperature between about 760 and about 1100°C.

7. The method of claim 1, wherein the positive electrode is prepared by:

mixing the lithium titanate, a conducting aid and a binder; and

shaping under pressure.

8. The method of claim 1, wherein the negative electrode is prepared by:

mixing the carbonaceous material and a binder to obtain an negative electrode mixture; and

shaping the negative electrode mixture under pressure.

9. The method of claim 1, wherein the electrolytic solution is prepared by:

dissolving a lithium salt in an organic solvent.

10. The method of claim 9, wherein the organic solvent is at least one selected from the group consisting of propylene carbonate, ethylene carbonate, butylene carbonate, γ -butyrolactone, 1,2-dimethoxyethane, dimethoxymethane, tetrahydrofuran and dioxolane.

11. The method of claim 9, wherein the lithium salt is at least one selected from the group consisting of $\text{LiN}(\text{CF}_3\text{SO}_2)_2$, LiClO_4 , LiPF_6 , LiBF_4 , LiAsF_6 , LiSbF_6 , LiCF_3SO_3 , LiCF_3CO_2 , $\text{LiC}_n\text{F}_{2n+1}\text{SO}_3$ and $\text{LiN}(\text{CF}_3\text{CF}_2\text{SO}_2)_2$.

12. The method of claim 1, wherein a concentration of the lithium salt in the electrolytic solution is between about 0.1 and about 2 mole/l.

13. The method of claim 6, wherein the titanium oxide is anatase or rutile.

14. The method of claim 6, wherein the lithium compound is at least one selected from the group consisting of lithium hydroxide, lithium carbonate and lithium oxide.

15. The method of claim 1, wherein the carbonaceous material is at least one selected from the group consisting of synthetic graphite, natural graphite, low crystalline carbon, coke and anthracite.

16. The method of claim 7, wherein the binder is a fluororesin.

17. The method of claim 8, wherein the binder is a fluororesin.

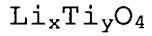
18. The method of claim 7, wherein the positive electrode contains about 70-90 wt% of the lithium titanate, about 5-20 Wt% of the conducting aid, and about 1-10% of the binder.

19. The method of claim 7, wherein the conducting aid is at least one selected from the group consisting of scaly graphite, acetylene black and carbon black.

20. The method of claim 8, wherein the negative electrode contains about 80-95% of the carbonaceous material and about 5-20% of the binder.

ABSTRACT

A method for manufacturing a lithium secondary cell comprising a positive electrode containing a lithium titanate as an active material, a negative electrode containing a carbonaceous material as an active material, and an electrolytic solution comprising a solution of a lithium salt in an organic solvent. The lithium titanate preferably has a composition of the formula:



($0.8 \leq x \leq 1.4$ and $1.6 \leq y \leq 2.2$).

The lithium secondary cell has a high capacity suitable for use as a power source for a wristwatch and good charge-discharge properties, at a nominal voltage of 1.5 V.

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